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chemistry does not appear to develop in the student the power of conducting original research, and at the same time to endeavor to suggest some means by which a more satisfactory state of things might be brought about. I have not been able, within the limits of this address, to consider the conditions of study during the third year of the student's career at college, or to discuss the increasing necessity for extending that course and insisting on the student carrying out an adequate original investigation before granting him a degree, but I hope on some future occasion to have the opportunity of returning to this very important part of the subject. If any of the suggestions I have made should prove to be of practical value and should lead to the production of more original research by our students, I shall feel that a useful purpose has been served by bringing this matter before this Section. In concluding I wish to thank Professor H. B. Dixon, Professor F. S. Kipping, and others, for many valuable suggestions, and my thanks are especially due to Dr. Bevan Lean for much information which he gave me in connection with that part of this address which deals with the teaching of chemistry in schools.

W. H. PERKIN.

SCIENTIFIC BOOKS.

La face de la terre. By EDOUARD SUÈSS. Translated from the German *Das Antlitz der Erde*, by EMMANUEL DE MARGERIE and others. Vol. II. Paris, Armand Colin & Cie., 1900. Pp. 878.

The first volume of this important translation has already been noticed in the pages of SCIENCE (Vol. VII., p. 803). The second volume contains the third part of the work dealing with 'The Seas.' After a brief review of the opinion of geographers concerning the question of changes of level of the sea in relation to the land, Suess adopts a terminology intended to avoid any implication of the movement of the land in relation to the sea in observed dis-

placement of shore-lines. These 'shifts of relative level,' as Robert Chambers termed them, are then qualified as *negative* when the sea-level appears to fall and positive when it appears to rise, in accordance with the terminology employed in reading tide-gauges. For the expression 'elevation of the continent,' we may substitute then 'negative displacement of the shore-line,' and for 'submergence of the continent,' positive displacement.

The geological structure of the lands about the Atlantic is treated with much care in order to bring out the history of displacements of shore-line in this part of the world. A similar discussion is devoted to the contours of the Pacific Ocean. In summarizing the characters of these two great ocean basins, Suess finds that "with the exception of the Cordillera of the Antilles and of the mountainous trunk of Gibraltar which circumscribes the two Mediterranean, no part of the contours of the Atlantic Ocean is determined by a folded chain. The internal border with groups of folds, the coasts cut by rias indicating a sinking of chains, the inclined fractures of horsts and the step-faults—such are the varied elements which determine the plan of the shores of the Atlantic Ocean."

As for the Pacific Ocean, "with the exception of a segment of the coast of Central America in Guatemala where the Cordillera making the turn of the Antilles is depressed, all parts of the border of the Pacific Ocean, of which the geology is known, are formed by chains of mountains folded towards the ocean in such a way that their external plications serve to outline the continent itself or constitute a belt of peninsulas and aligned islands." He then considers the ancient Paleozoic seas with the view of sifting the evidence which their sediments and faunas present in relation to the question of 'submergence and emergence of lands' and 'movements of the hydrosphere.' Our author finds insuperable difficulties in the commonly accepted explanation, and in this and following sections of the work develops the idea of swayings of the ocean waters alternately towards the equator and the poles to account for the numerous instances of advance and retreat of the sea afforded by the Paleozoic and Mesozoic for-

mations of the existing continents. Mesozoic and Tertiary geology are treated in the same comprehensive way, in the endeavor to show the former relations of sea-level to the lands.

In the last chapter of this volume, Suess gives the principal points in his theory. "Once," he states, "that the marine depressions are regarded as sunken tracts, the continents acquire the character of horsts, and the pointed form directed towards the south, in the case of Africa, India and Greenland, is explained by the intersection of fields of sinking of which the principal domain is found in the south.

"The crust of the earth sinks; the sea follows it. But inasmuch as the sinkings of the lithosphere are limited in extent, the lowering of the surface of the sea affects the entire perimeter of the oceanic areas; it produces a general negative movement.

"The formation of sediments causes a positive uninterrupted eustatic displacement of the shore-lines." Other causes, such as variation in the quantity of water in the seas dependent upon the rate of formation of silicates and upon the variable action of volcanoes, give rise also to eustatic movements of the ocean. These changes with the movements of the ocean above noted form the outlines of his theory.

Suess appears to be placed in the necessity of minimizing the changes of level which many geologists have postulated in recent geologic time, for these supposed changes exceed the effects attributable to the operations which he invokes. Thus, to take but one example of evidence adduced in favor of profound alteration of level—that of the so-called submarine gorges of the Hudson, the Congo, and other rivers, Suess contends with Forel and others that these channels are the result of excavation and deposition now going on as in Lake Geneva. In this view such canions are not criteria of change of level. To this criticism of the doctrine of extreme changes of recent level may be added that made by Davis upon the interpretation of fjords in high glaciated latitudes, that the ice has excavated the deep fjords and that their depth below sea level is not necessarily a

measure of depression of the land (Proc. Boston Soc. Nat. His., Vol. XXIX. 227-322. 1900). So also the high terraces reported in the far north are not without close scrutiny to be taken as evidence of elevation since there are diverse kinds of terraces, some of them built in ice-confined waters far above sea-level.

It is understood that the venerable author of *Das Antlitz der Erde* has in preparation a concluding section of his great work. In that we may expect to find the discussion of many questions, which his singularly attractive hypothesis of a swinging, rising and falling ocean raises, in the light of the work of Lord Kelvin and other physico-geologists upon the rate of contraction of the earth and upon the apparent tilting of a continent with its Great Lakes, as in the case of North America.

The two volumes of the new French edition form perhaps the best summary extant of the geology of the globe and should find an English translator.

J. B. WOODWORTH.

Mesures électrique; essais laboratoire. By E. VIGNERON and P. LETHEULE. Paris, Gauthier Villars. (No date.)

Resistance électrique et fluidité. By GOURÉ DE VILLEMONTEÉ, Paris. Gauthier-Villars. (No date.)

These two small octavo volumes, of one hundred and eighty and one hundred and eighty-seven pages respectively, are installments of the *Encyclopédie scientifique des aide-mémoire*.

The first contains a good discussion of the methods for measuring electric current, electro-motive force, resistance, electrostatic capacity and self-induction.

The second is a very complete résumé of the experimental work that has been done in the attempt to discover the relationship between the electrical resistance of electrolytes and their viscosity.

Vigneron and Letheule devote eight introductory pages to *généralités sur les grandeurs*. They say that "une grandeur est dite mesurable quand on peut la comparer à une grandeur de même espèce et que le résultat de la comparaison donne à notre esprit une satisfaction complète." This statement is, indeed, somewhat